NATIONAL RADIO ASTRONOMY OBSERVATORY
Green Bank, West Virginia

300-FOOT CONTROL COMPUTER MEMO NO. 22

ANALOG TO DIGITAL OBSERVING

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This type of observing uses the A/D's and the multiplexer rack. Two distinct modes of observing are accomplished in this manner: (1) continuum and (2) fast-sample (pulsars).

Continuum

This is a time scheduled task to allow sampling the A/D's with the multiplexer every 50 ms. Samples are accumulated for the integration period and averaged for the data. The integration period is an even multiple of the sample period so that time and observing coordinates can be stored as the center of the sample. Currently, eight channels can be sampled simultaneously. After the header information is written at the center of first integration, the data are stored in subblocks until the tape buffer is full and get written to storage (with another buffer switched in automatically for data collection). Data written to storage is also transmitted to the analysis computer. A data subblock is as follows:

Word	Contents
1-2	H observed position
3-4	V observed position
5	Radiometer 1 Sample
6	" 2 "
7	" 3 "
8	" 4 "
9	" 5 "
10	" 6 "
11	" 7 "
12	" 8 "

The current buffer size is 600 words--header information and 34 data subblocks.

There are three Modes for continuum scans:

(1) Timed-Cal Scans.
(2) Pulsed-Cal Scans.
(3) No-Cal Scans.

The INTEGRATION PERIOD and CAL-PERIOD are specified in tenths of seconds. The CAL-PERIOD is necessary for Timed-Cal scans. The cal-period must be an even multiple of the INT. PERIOD. The scan is automatically terminated when sufficient data inputs are collected. The scan is 2*CALPER long with the following sequence: OFF-CAL -- ON-CAL -- OFF-CAL, where OFF-CAL is 1/2 CALPER. A 200 ms sleep is coded when turning the CAL on or off to prevent erroneous data spikes. During the sleep time, no data is collected.

Pulsed-Cal scans use the method of a drift scan and firing the noise tube on the 3rd, 18th, ... and each 15th integration period thereafter in the scan. The analysis programs remove the cal points and replace them with the average of data preceding and following the cal point. The cal values are averaged for the entire scan. Again, the 200 ms sleep is used when turning the cal on and off. This 400 ms time is actually subtracted from the cal-time.

No-Cal scans do not turn on the noise tube during the scan. These scans use the cal factor computed from the last Timed-Cal scan in order to display the data in normalized temperature units.

The cal-mode is stored in the tape header along with the number of samples and receivers used. The tape buffer length written is always the same; however, some subblocks in the last buffer may be garbage.

Signal conditioning cards are used in the A/D rack. Presently, we use 20 Hz cards due to 50 ms sampling.

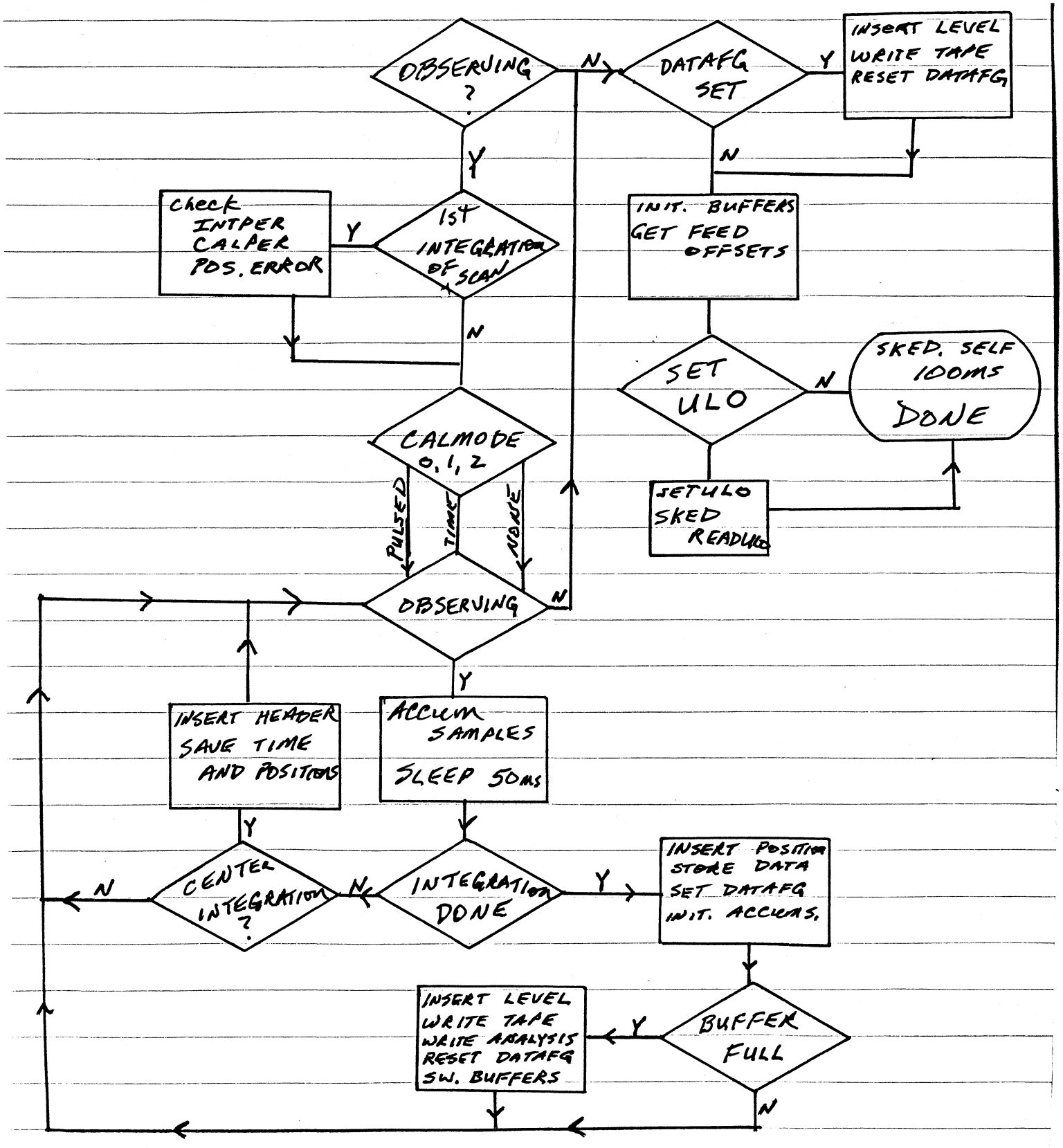
The new receiver being constructed by Behrens will have 14 inputs. The program will, by necessity, need to sample and store all 14 inputs.

Fast-Sample (Pulsars)

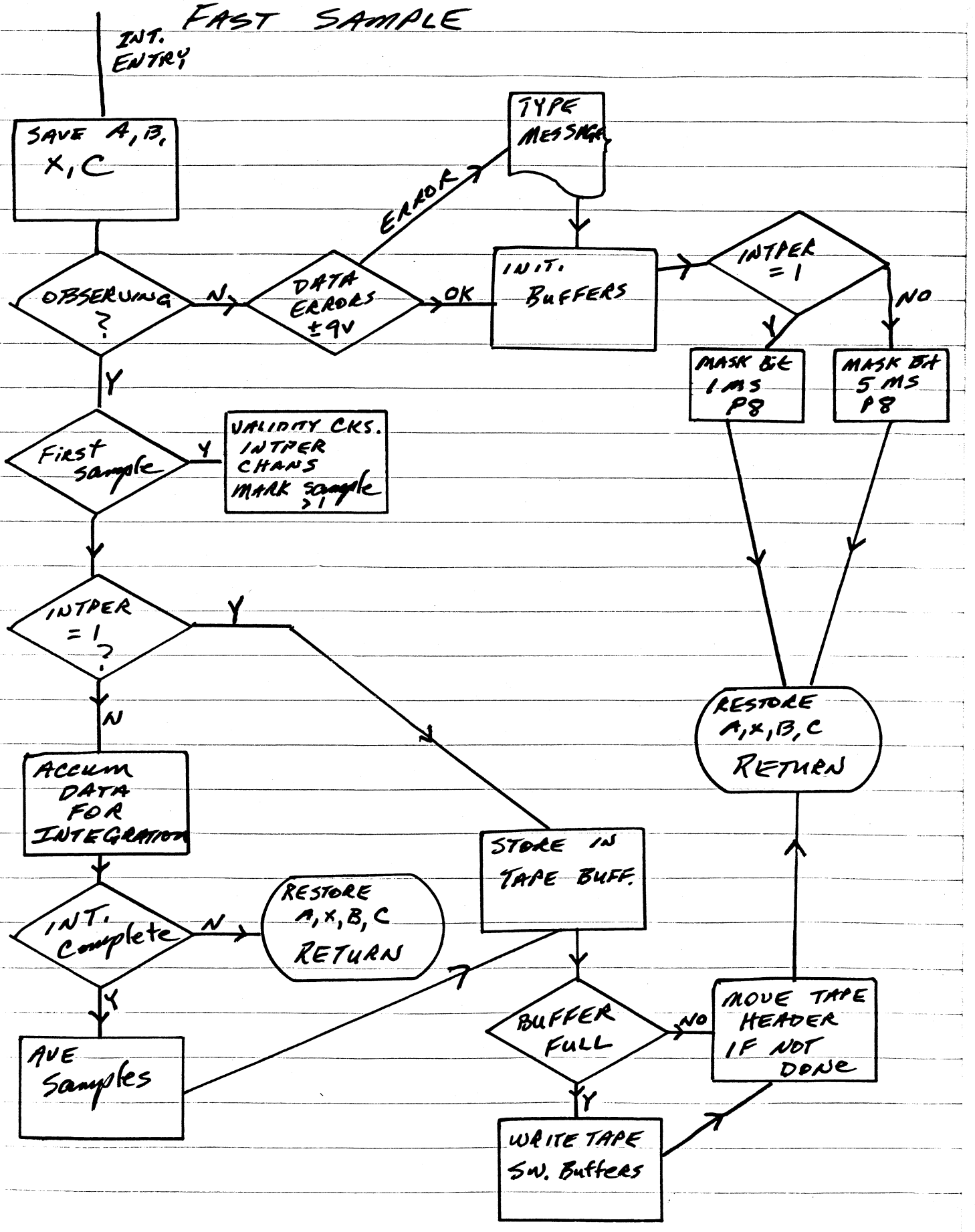
This program is time scheduled normally at 5 ms sampling, where the integration period (in milliseconds) can be 5 or multiples of 5. Samples are collected each 5 ms and averaged for the integration period. Channels 1, 2, 4, or 8 can be sampled. The header along with time and position information is moved when 1st sample is stored in the tape buffer (1024 points). Buffer switching and writing are alone on Buffer Full Check. Nothing is sent to analysis computer at this time due to lack of a reduction program. Signal conditioning cards of 200 Hz are used for this mode of observing.

A 1 ms interrupt can be used for 1 ms timing. The integration period is 1 ms and a maximum period is 1 ms and a maximum of 4 channels can be sampled. No averaging is necessary and the samples are stored directly in the tape buffer. Fixed length seconds of 1078 words (54 header and 1024 data samples) are written. The signal conditioning cards must be 1 kHz for this sample period.

CONTINUUM DATA FLOW



FAST SAMPLE


INT. ENTRY
SAVE A, B, X, C
OBSERVING ?
N
DATA ERRORS ±9V
ERROR
TYPE MESSAGE
OK
INIT. BUFFERS
INTPER = 1
Y
NO
MASK BIT 1 MS P8
MASK BIT 5 MS P8
Y
First sample
Y
VALIDITY CKS. INTPER CHANS MARK sample >1
INTPER = 1 ?
Y
N
ACCUM DATA FOR INTEGRATION
INT. Complete
N
RESTORE A, X, B, C RETURN
Y
AVE Samples
STORE IN TAPE BUFF.
BUFFER FULL
NO
MOVE TAPE HEADER IF NOT DONE
Y
WRITE TAPE SW. Buffers
RESTORE A, X, B, C RETURN